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Research Article

Primula yanbianensis (Primulaceae), a new species in *Primula* sect. *Cortusoides* from Sichuan, China

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Abstract

Primula yanbianensis T.Shuai, Lei Cai & Z.K.Wu, a new species of Primulaceae from Sichuan, China, is described and illustrated. Morphological evidence supports *P. yanbianensis* as a member of *P.* sect. *Cortusoides*, which is characterised by lack of farina, generally well furnished with multicellular hairs, subrounded leaf blades are more or less lobed, with distinct petiole and a deeply cordate base and campanulate or narrowly campanulate calyx not accrescent after anthesis. The new species is characterised by having umbel in whorls of 1–2, scape usually lower than leaf clusters, bracts broadly ovate and rose to pink petals distinctly veined. The distribution, morphological comparison with closely-related species and conservation status of the new species are also provided.

Key words: New species, *Primula* sect. *Cortusoides*, Sichuan, yan bian bao chun

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Introduction

Primula L. is one of the largest genera in Primulaceae, encompassing ca. 545 species worldwide (POWO 2024). Most *Primula* species are native to temperate and alpine regions of the Northern Hemisphere, with only a few species occurring in the Southern Hemisphere (Hu 1990; Hu 1994; Richards 2002). The south-western region of China (especially the Himalayan-Hengduan Mountains) is the centre of diversity of the genus, with more than 300 species recorded, which are distributed mainly in western Sichuan, eastern Xizang and north-western Yunnan (Hu 1990; Hu and Kelso 1996; Richards 2002).

Primula Sect. *Cortusoides* Balf. f. (39: 140, 1913) (Balfour 1913), comprising about 25 species worldwide and 19 species being recorded in China (of which *P. pelargoniifolia* G.Hao, C.M.Hu & Z.Y.Liu and *P. longipilosa* Ze H.Wang & H.Peng are two newly-described species in recent years (Xu et al. 2014a; Wang et al. 2022), is widely distributed in central and eastern Asia, but its distributional centre is in SW China (Hu 1990; Xu et al. 2014a; Wang et al. 2022). Morphologically, the section is characterised by the plants being efarinose, but generally well furnished with multicellular hairs, subrounded leaf blades are more or less lobed, with distinct petiole and a deeply cordate base

and campanulate or narrowly campanulate calyx not accrescent after anthesis (Smith and Fletcher 1944).

As one of the hotspots of biodiversity in China, Sichuan has over ca. 170 species of *Primula* distributed all over its range (Wu 1999). With the increased exploration of the region, many new additions of *Primula* species have constantly been reported in Sichuan over the past two decades (Hu and Ceng 2003; Hu and Hao 2006; Wu et al. 2013; Xu et al. 2014b, 2015, 2016a, 2016b, 2016c, 2017a, 2017b, 2019; Ju et al. 2018, 2021, 2023; Yuan et al. 2018; Li et al. 2023; Luo et al. 2023).

During a botanical expedition to Yanbian, Sichuan, south-western China in June 2017, we discovered a peculiar *Primula* population with long white multicellular hairs all over the plant, subrounded leaf blades being more or less lobed, with distinct petiole and a deeply cordate base and narrowly campanulate calyx. These features indicate that it should be a member of the *P.* Sect. *Cortusoides*. However, its scape is shorter than the leaves, umbel is in whorls of 1–2, bracts are broadly ovate and rose to pink petals are distinctly veined, all of which indicate it to be a distinct species. We surveyed the site and adjacent area again and collected specimens in July 2020 and June 2024. After a full observation of the morphological characteristics and comparing the relevant literature and specimens for related species, we found that this species did not match the known species of *Primula* and convinced us that this plant is novel and previously undescribed. Therefore, we describe and illustrate the plant as a new species here.

Materials and methods

The morphological observation, measurements and description of the new species were based on both dried specimens and living plants from Yanbian County, Sichuan Province. Morphological comparisons with closely-related species were made by reviewing specimens from major herbaria, such as PE, P, E, KUN, SM and NY and relevant literature reports (Hu 1990; Hu and Kelso 1996; Xu et al. 2014a; Wang et al. 2022). The information regarding the type specimens involved in this study is as follows: *P. longipilosa*, Gengma TCM Resources Survey Exped. 5309260482, KUN1536784, KUN!; *P. neurocalyx* Franch., P.G. Farges 1369, P00649666, P!; *Primula sinomollis* Balf.f. & Forrest, Forrest, G. 5523, E00024096, E!. All morphological characters of *P. yanbianensis* and its morphologically similar species in the *P.* sect. *Cortusoides*, including *P. neurocalyx*, *P. longipilosa* and *P. sinomollis*, were measured using a Vernier caliper by living plants from their type localities . The conservation status of the new species was assessed following the guidelines of the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Committee 2024).

Taxonomic treatment

Primula yanbianensis **T.Shuai, Lei Cai & Z.K.Wu, sp. nov.**
urn:lsid:ipni.org:names: 77356677-1

Diagnosis. The new species is most similar to *P. neurocalyx*, *P. longipilosa* and *P. sinomollis*, sharing multicellular hairs covering the plant, subrounded leaf blade are more or less lobed, with distinct petiole and a deeply cordate base

and campanulate or narrowly campanulate calyx. However, the new species is distinguished from the latter three mainly by its scape usually being lower than leaf clusters, umbel is in whorls of 1–2, broadly ovate bracts and rose to pink petals are distinctly veined (Figs 1–3). The main morphological distinctions between *P. yanbianensis*, *P. neurocalyx*, *P. longipilosa* and *P. sinomollis* are summarised in Table 1.

Type. China • Sichuan: Panzhihua City, Yanbian County, Yongxing Town. 27°4'32.95"N, 101°24'17.75"E, 1530 m alt., 28 June 2017 (fl.), *Zhikun WU & Lei Cai*, L.Cai2017070; 15 July 2020 (fl.), *Zhikun WU*, ZKWu2020053 (***holotype*:** KUN!; ***Paratype*:** KUN!).

Description. A perennial herb with a short and usually inconspicuous rhizome and numerous robust fibrous roots, densely covered throughout with multicellular hairs. ***Leaves*** all rising from the root, forming a rosette, leaves including the petiole 10–25 cm long, petiole 5–18 cm, clothed with long spreading soft multicellular hairs, slightly sheathed at the base; leaf blade suborbicular to reniform, 4–12 cm long, 3–10 cm wide, apex obtuse, base cordate to deeply cordate, the leaf margin is undulate and lobed, the upper surface of the leaf sparsely septate hairs, while the lower surface covered with multicellular hairs along all the veins, mid-rib and 4, 5 pairs of pinnate lateral veins slightly impressed above, prominent below, reticulation open and rather feebly

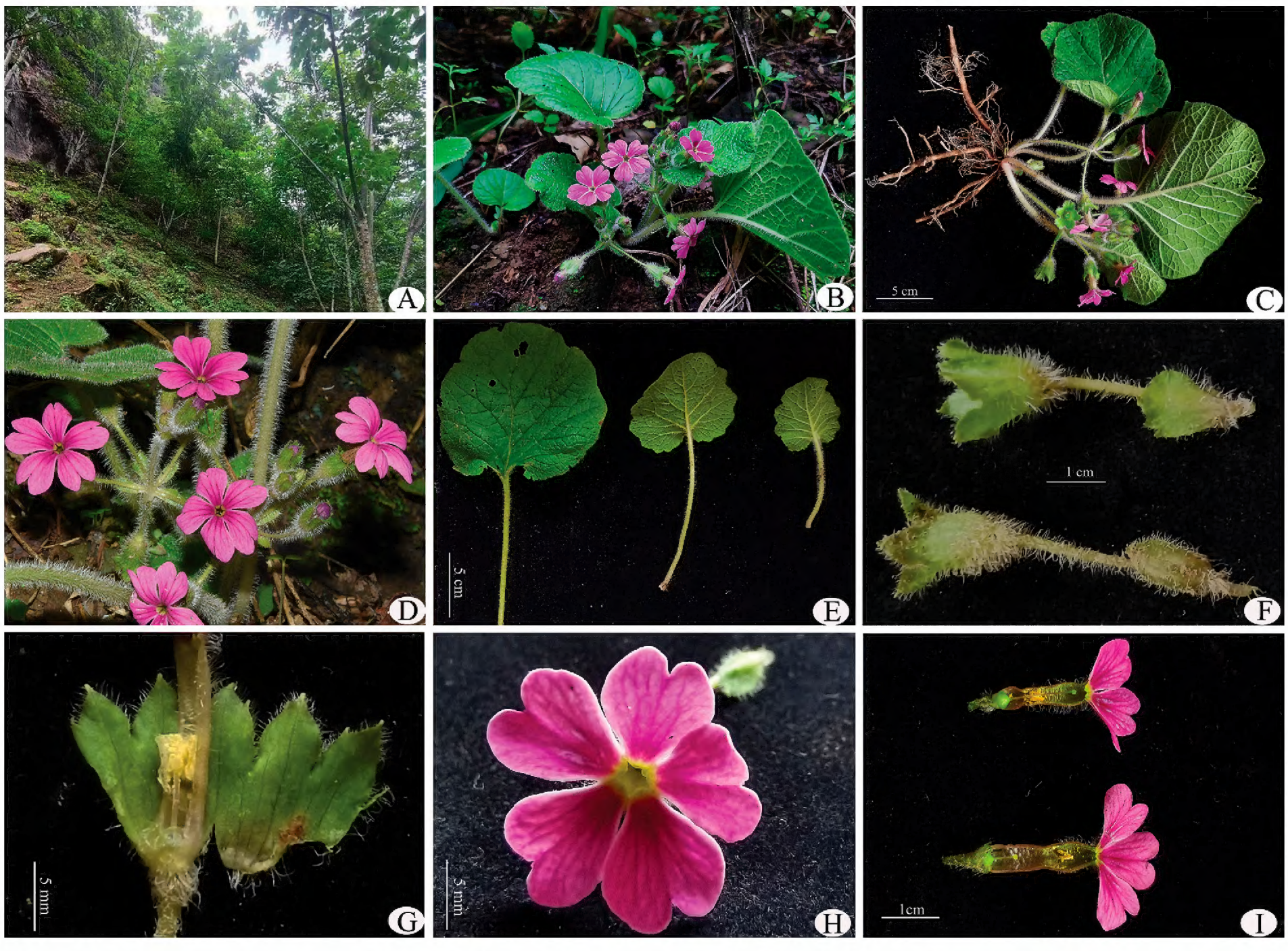


Figure 1. *Primula yanbianensis* sp. nov. **A** habitat **B** habit in flowering **C** fresh plant with roots **D** inflorescence **E** leaves, left: upper surface, right: lower surface **F** bracts and calyx **G** calyx and stamens **H** flower, front view **I** pin flower and thrum flower. Photographed by Z.K.Wu.

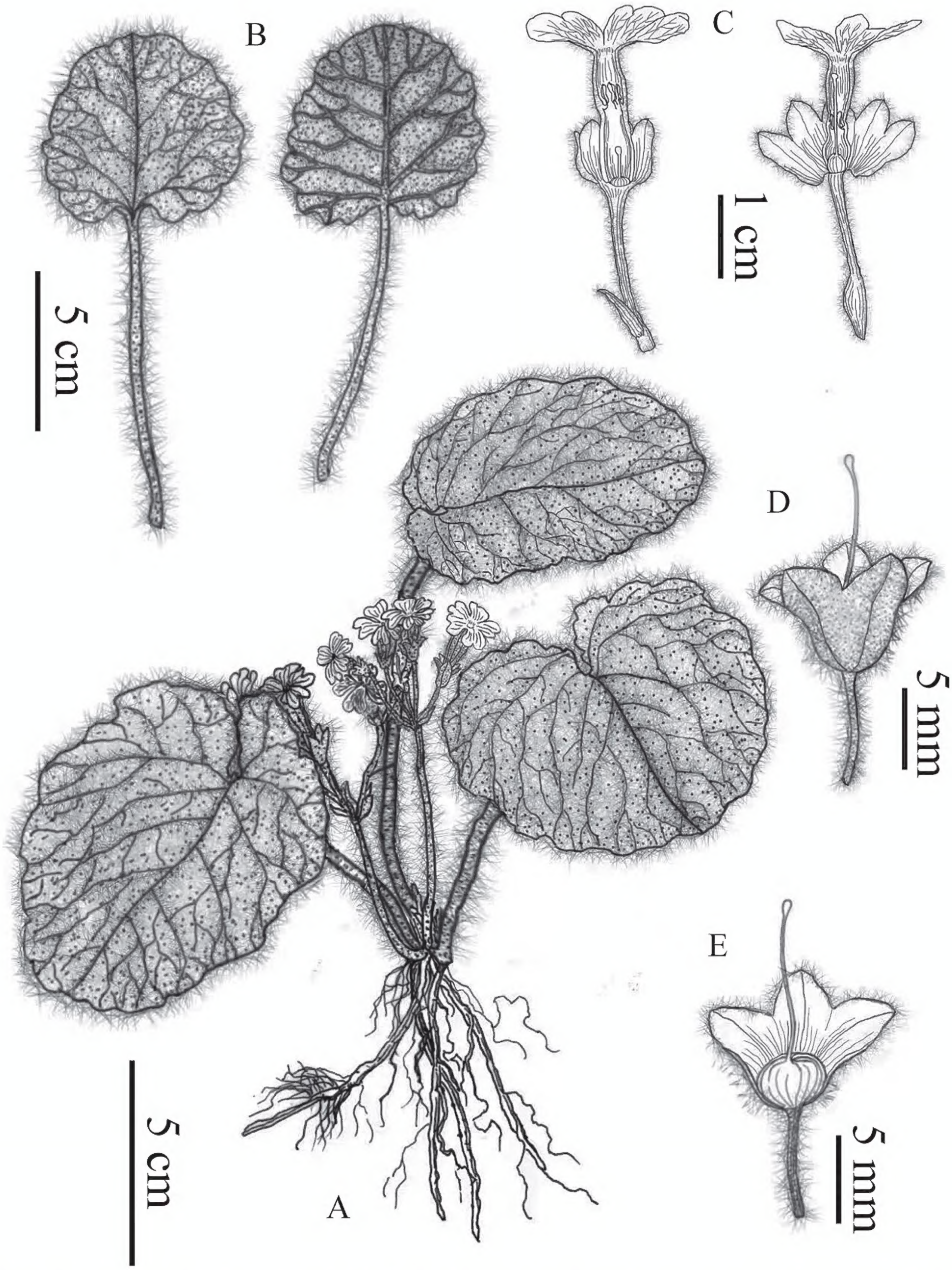


Figure 2. *Primula yanbianensis* sp. nov. **A** habit **B** leaves, left: upper surface, right: lower surface **C** flower, left: thrum flower, right: pin flower **D** calyx and stigma **E** calyx and ovary. Drawn by Ms. Xiang-Li Wu.

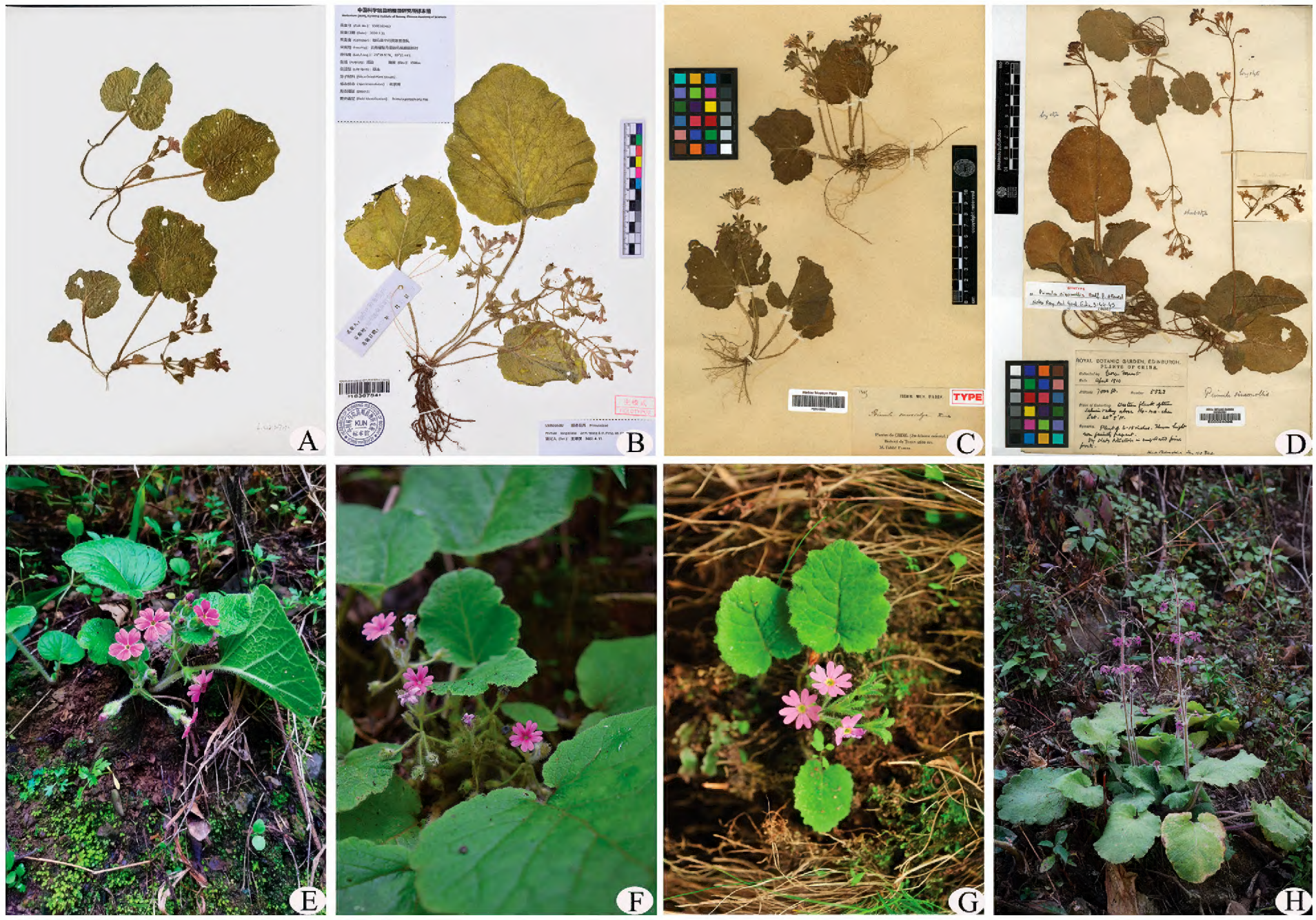


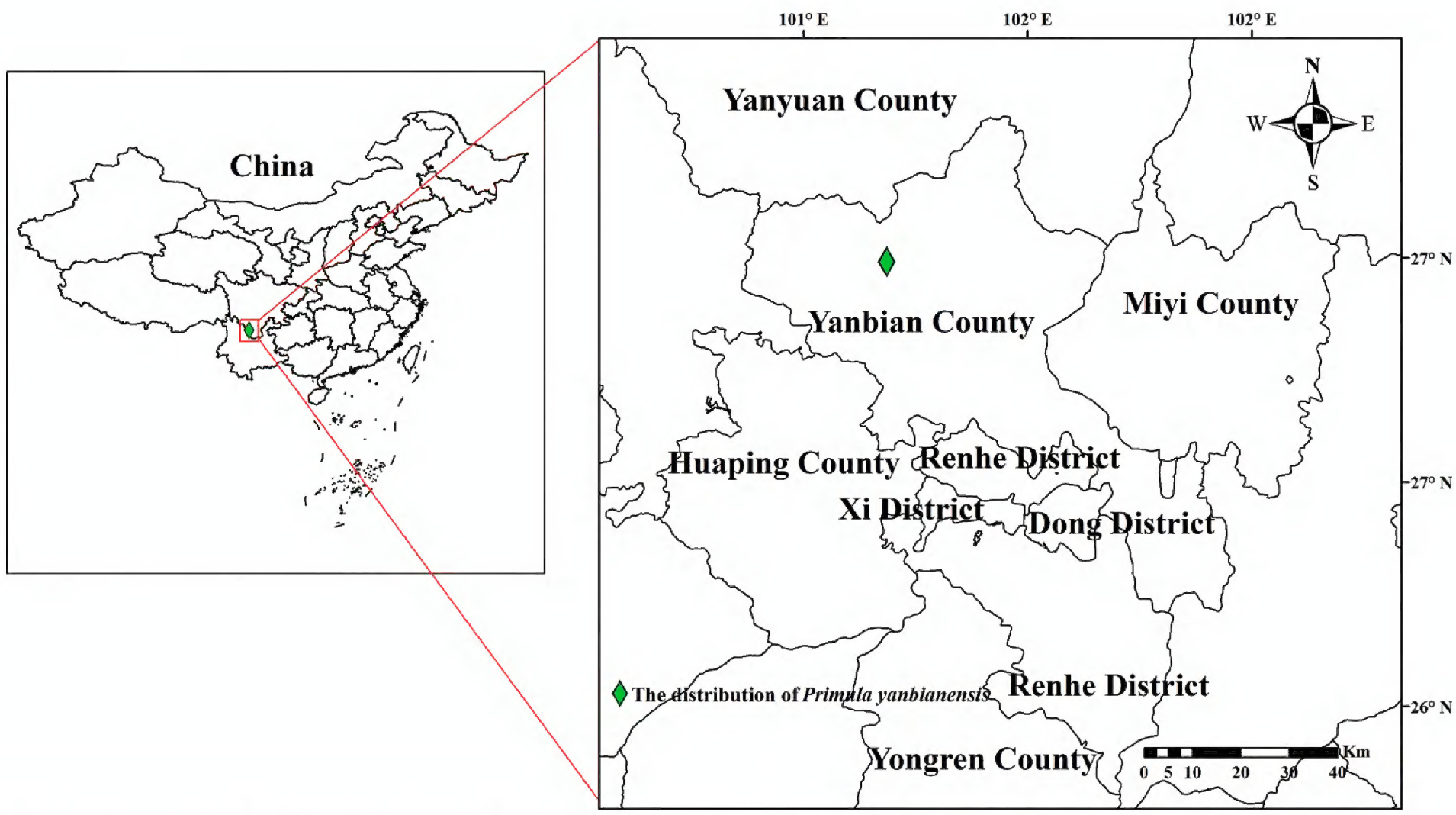
Figure 3. *Primula yanbianensis* and three of its allies **A** holotype of *P. yanbianensis* (L.Cai 2017070, KUN!) **B** holotype of *P. longipilosa* (Gengma TCM Resources Survey Exped. 5309260482, KUN!) **C** type of *P. neurocalyx* (P.G. Farges 1369, P!) **D** syntype of *P. sinomollis* (Forrest, G.5523, E!) **E** *P. yanbianensis* **F** *P. longipilosa* **G** *P. neurocalyx* **H** *P. sinomollis*. **E, G, H** photographed by Z.K. Wu from their type locality, **F** photographed by Li Chen from its type locality.

developed. ***Scapes*** 6–13 cm long, 1, 2 rising from the middle of the rosette leaves, shorter than leaves, densely covered with long soft multicellular hairs, carrying 1, 2 superposed umbels each with 3–5 flowers. ***Bracts*** broadly ovoid, 3–6 mm long, usually shorter than half of the pedicel, with long soft multicellular hairs. ***Pedicel*** 1, 2 cm, with a dense covering of long multicellular hairs. ***Flower*** heterostylous. ***Calyx*** narrowly campanulate to campanulate, 6–8 mm long, covered with long multicellular hairs abaxially, inner surface glabrous, cut to middle, lobes broadly ovate, with 3–5 prominent veins, apex with short cusp. ***Corolla*** rose to pink, tube 1.2–1.8 cm long, with long soft multicellular hairs outside, limb 1.5–2 cm in diameter, lobes obcordate, 6–8 mm in diameter, with prominent veins from yellow mouth, apex deeply emarginate. ***Pin flowers*:** tube 1.2–1.5 cm long, style 10–12 mm long, stamens at ca. 3 mm above the base of corolla tube; ***thrum flowers*:** tube 1.2–1.8 cm long, style 3–5 mm long, stamens at 2/3 length of corolla tube, ca. 10–12 mm above the base of corolla tube. Ovary globose (Figs 1, 2). ***Capsule*** unknown.

Distribution and habitat. This new species is currently only known from the type locality near Qingyi Road, Yongxing Town, Yanbian County, Panzhihua City, Sichuan Province, China and is mostly found on grassy slopes along the valley forest margin, at altitudes of 1500–1650 m (Fig. 1; Map 1).

Table 1. Comparison of main morphological characters amongst *P. yanbianensis*, *P. neurocalyx*, *P. longipilosa* and *P. sinomollis*.

Characters	*P. yanbianensis*	*P. longipilosa*	*P. neurocalyx*	*P. sinomollis*
Leaf blade	suborbicular to reniform, 3–10 cm in diameter, adaxially with sparsely multicellular hairs, abaxially with multicellular hairs along veins	cordate to broad cordate, 4–16 cm in diameter, covered with white soft multicellular hairs on both sides	orbicular or broadly ovoid, 3–7 cm in diameter, adaxially with sparsely multicellular hairs, abaxially with long hairs along veins	broadly elliptic to suborbicular, 3–8 cm in diameter, adaxially with appressed multicellular hairs, abaxially with long hairs along veins
Bract	broadly ovoid, 3–6 mm long	narrowly lanceolate, 5–15 mm long	linear-lanceolate, 6 mm long	linear to linear-lanceolate, 6–8 mm long
Scape	usually shorter than leaf clusters	shorter than or almost equal to leaf clusters	slightly longer than or equal to leaf cluster	usually much longer than leaf clusters
Inflorescence	umbels, 1–2 whorled, with each round containing 3–5 flowers	racemes mostly, sometimes umbels, 2, 3 rising from the rosette leaves, each scape has 7–25 flowers arranged in a racemose inforescence	umbels, 1, 2 whorled, with each round containing 3–7 flowers	umbels, 3–10 whorled, with each round containing 3–9 flowers
Calyx	6–8 mm long, lobes broadly ovate	6–10 mm long, lobes triangular to ovate-triangular	7–9 mm long, lobes rectangular to rectangular-lanceolate, herbaceous	5, 6.5 mm long, distinctly 5-ribbed, lobes narrowly lanceolate
Flowers	heterostylous, corolla rose to pink with distinctive veins on all part of lobes, yellow eye	heterostylous, corolla pink to pink rose, with veins prominent at base of lobes, inconspicuous at apex, purple eye	homostylous, corolla red-purple, lack veins on lobes, yellow eye	heterostylous, corolla light red to magenta or purple-red, lack veins on lobes, purple eye
Flowering time	June to July	July	May to July	April



Map 1. Location of the distribution of *Primula yanbianensis* in Yanbian County, Sichuan.

Phenology. Flowering occurs from June to July.

Etymology. The specific epithet of the new species is taken from the Chinese Pinyin “yanbian”, the name of the county in south-western Sichuan, China, where the type specimen was collected (Map 1).

Vernacular name. Chinese mandarin: yan bian bao chun (盐边报春).

Conservation status. This new species is a rare species with a restricted distribution. Currently, only one population with less than 150 individuals has been found in the type locality. We have observed a steady decline in the territory area of the habitat due to road construction and grazing, based on the latter two field expeditions conducted in 2020 and 2024. Therefore, in combination with the information currently available and in accordance with the guidelines for the use of the IUCN Red List Categories and Criteria (IUCN 2024), the conservation status of this new species has been assessed as 'Critically Endangered' (CR B1ab(i, iii)).

Additional specimens examined (*paratypes*). • The same locality as holotype, 18 June 2024, *Tian Shuai*, TSh 2024045 (KUN!).

Discussion

In the subgenus *Auganthus* of *Primula*, which encompasses sections such as *Auganthus*, *Monocarpicae*, *Cortusoides*, *Malvacea*, *Pycnoloba*, *Obconicolisteri*, *Reinii*, *Ranunculoides* and *Bullatae*, many species exhibit similar leaf characteristics. These include long petioles and multicellular hairs with leaf blades that are suborbicular to reniform in shape and deeply cordate at the base. Consequently, when encountering a plant within this subgenus, it is essential to determine the appropriate section for classification. In these closely-related sections, variations in calyx structure can be instrumental in distinguishing them from one another. Upon discovering *P. yanbianensis* in Yanbian, we considered whether it might belong to sect. *Malvacea*; however, its calyx traits are distinctly different from those found within the *Malvacea* series of *Primula*. The calyx characteristics of members belonging to sect. *Malvacea* serve as key diagnostic features that differentiate them from other sections: they possess foliaceous calyxes with more or less prominent well-developed reticulate venation and an obconical tube that expands into broad spreading lobes. During fruiting stages, the calyx enlarges to form a platter-like expansion at its center where a globose capsule rests; notably thickened throughout its entirety. Although *P. malvacea* is also present in southwestern Sichuan and adjacent northwestern Yunnan, which exhibiting significant morphological variation in inflorescences and flowers, and we observed both verticillate inflorescence types and racemose inflorescence types within this region as well. Nevertheless, the foliaceous calyx traits of *P. malvacea* are markedly distinct from the campanulate calyx characteristic of *P. yanbianensis* (Fig. 1D). This distinction is why we did not classify this new species under sect. *Malvacea*; instead based on its campanulate calyx morphology we have classified *P. yanbianensis* within sect. *Cortusoides*.

Morphologically, *P.* sect. *Cortusoides* is characterised by a lack of farina, the plants are generally covered with multicellular hairs, the petiole is strongly conspicuous, the leaf blades are suborbicular to reniform, the margins are lobed, the bases are cordate to deeply cordate and the calyxes are campanulate or narrowly campanulate (Smith and Fletcher 1944). These traits make it easy to determine at the sectional level. However, some traits are overlapping in the closely-related species in this section, making it difficult to identify these species in field, for example, *Primula mollis* group (*P. mollis* Nutt.ex Hook.,

P. sinomollis, *P. neurocalyx* and *P. longipilosa*), *Primula vaginata* group (*P. vaginata* Watt, *Primula septemloba* Franch., *Primula palmata* Hand.-Mazz. and *Primula loeseneri* Kitag.), as well as *Primula cinerascens* group (*Primula cinerascens* Franch., *Primula polyneura* Franch., *Primula scopulicola* G.Hao, C.M.Hu & Y.Xu and *Primula sieboldii* E.Morren). The new species *P. yanbianensis* is similar to *P. longipilosa*, *P. neurocalyx* and *P. sinomollis*, but *P. yanbianensis* can be easily separated from these three species by its umbel being in whorls of 1–2, scapes usually lower than the leaf clusters, bracts broadly ovate and rose to pink petals with conspicuous veins. Overall, the new species is most closely related to *P. longipilosa* morphologically, but *P. longipilosa* is mainly distributed in Yunnan near the border to Myanmar (Wang et al. 2022), whereas the new species is distributed in Sichuan and no similar populations have been found in the intermediate area between these two. Therefore, *P. yanbianensis* might have diverged from their ancestors after geographical isolation, but its phylogenetic relationships need further investigation.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

All authors participated in the expedition, T. Shuai and Y-F Chen did the measurement, T. Shuai and Z.K.Wu wrote the manuscript.

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Data availability

All of the data that support the findings of this study are available in the main text.

References

Balfour BI (1913) Chinese species of *Primula*. Journal of the Royal Horticultural Society of London 39: 128–167.

Hu CM (1990) Primulaceae. In: Chen FH, Hu CM (Eds) Flora Republicae Popularis Sinicae (Vol. 59). Science Press, Beijing, 1–277.

Hu CM (1994) On the geographical distribution of the Primulaceae. Journal of Tropical and Subtropical Botany 2: 1–14.

Hu CM, Ceng YY (2003) Two new species of *Primula* (Primulaceae) from China. Novon 13(2): 196–199. https://doi.org/10.2307/3393518

Hu CM, Hao G (2006) A new synonym of *Primula boreiocalliantha* (Primulaceae). Journal of Systematics and Evolution 44(4): 477–479. https://doi.org/10.1360/aps050040

Hu CM, Kelso S (1996) Primulaceae. In: Wu ZY, Raven PH (Eds) Flora of China (Vol. 15). Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 99–185.

IUCN (2024) Guidelines for Using the IUCN Red List Categories and Criteria. Version 16. Prepared by the Standards and Petitions Committee. [Accessed on 13 September 2024]

Ju WB, Huang Q, Sun ZY, Huang WJ, Li HC, Gao XF (2018) *Primula luteoflora* (Primulaceae), a new species from Sichuan, China. Phytotaxa 367(3): 297–300. https://doi.org/10.11646/phytotaxa.367.3.10

Ju WB, Deng HN, Zhu DH, Gao YD, Gao XF, Xu BO (2021) *Primula dujiangyanensis* (Primulaceae) discovered from Sichuan, southwest China. Phytotaxa 510(3): 275–280. https://doi.org/10.11646/phytotaxa.510.3.7

Ju WB, He LY, Lan Q, Wu YH, Deng HN, He XJ, Gao XF, Xu B (2023) *Primula lizipingensis* (Primulaceae), a new species from Sichuan, China. PhytoKeys 236: 135–143. https://doi.org/10.3897/phytokeys.236.112169

Li X, Cheng YH, Lin HQ, Chen C, Gao XF, Deng HN, Yu F, Anđelka PM, Ju WB, Xu B (2023) *Primula wolongensis* (Primulaceae), a new species of the primrose from Sichuan, China. PhytoKeys 218: 47–57. https://doi.org/10.3897/phytokeys.218.91161

Luo JJ, Zhang MK, Liu XF, Chen H, Li TY, Ma XD, Huang K, Fu ZX (2023) *Primula xilingensis* (Primulaceae), a new species from Sichuan, China. PhytoKeys 234: 135–143. https://doi.org/10.3897/phytokeys.234.108411

POWO (2024) Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. http://www.plantsoftheworldonline.org/ [Retrieved 6 July 2024]

Richards J (2002) *Primula*, 2nd edn. Batsford: London, UK, 29–30.

Smith WW, Fletcher HR (1944) The Genus *Primula*: Section Cortusoides Balf. f. Transactions of the Botanical Society of Edinburgh 34(1): 55–115. https://doi.org/10.1080/13594864409441552

Wang ZH, Wang Y, Chen L, Peng H, Wu ZK, Guo G (2022) *Primula longipilosa* (Primulaceae), a new species from Yunnan, China. PhytoKeys 194: 15–22. https://doi.org/10.3897/phytokeys.194.81335

Wu YT (1999) Flora Sichuanica (Vol. 13) Sichuan Science and Technology Press, Chengdu, 132–279.

Wu X, Xu Y, Hu CM, Hao G (2013) *Primula mianyangensis* (Primulaceae), a new species from Sichuan, China. Phytotaxa 131(1): 49–52. https://doi.org/10.11646/phytotaxa.131.1.9

Xu Y, Liu ZY, Yu XL, Hu CM, Hao G (2014a) *Primula pelargoniifolia* (Primulaceae), a new species from Chongqing, China. Annales Botanici Fennici 51(1–2): 125–127. https://doi.org/10.5735/085.051.0117

Xu Y, Yuan S, Hu CM, Hao G (2014b) *Primula dejuniana* (Primulaceae), a new species from Sichuan, China. Annales Botanici Fennici 51(6): 372–374. https://doi.org/10.5735/085.051.0602

Xu Y, Liu TJ, Hu CM, Hao G (2015) *Primula anthemifolia* (Primulaceae), a new species from Sichuan, China. Annales Botanici Fennici 52(5–6): 373–375. https://doi.org/10.5735/085.052.0518

Xu Y, Hu CM, Hao G (2016a) *Primula scopulicola* (Primulaceae), a new species from Sichuan, southwestern China. Annales Botanici Fennici 53(5–6): 277–279. https://doi.org/10.5735/085.053.0602

Xu Y, Li CH, Hu CM, Hao G (2016b) *Primula wawushanica* sp. nov. (Primulaceae) from Sichuan, southwestern China. Nordic Journal of Botany 34(2): 156–158. https://doi.org/10.1111/njb.00894

Xu Y, Yan HF, Hu CM, Hao G (2016c) *Primula persimilis* sp. nov. (Primulaceae) from Sichuan, China. Nordic Journal of Botany 34(4): 409–412. https://doi.org/10.1111/njb.01130

Xu Y, Hu CM, Hao G (2017a) *Primula centellifolia* (Primulaceae), a new species from south-central China. Phytotaxa 326(4): 259–263. https://doi.org/10.11646/phytotaxa.326.4.4

Xu Y, Huang G, Hu C, Hao G (2017b) *Primula pengzhouensis* (Primulaceae), a new species from Sichuan, southwestern China. Plant Diversity 39(4): 229–231. https://doi.org/10.1016/j.pld.2017.08.003

Xu Y, Hao G, Hu CM (2019) *Primula vallicola* sp. nov. (Primulaceae) from Sichuan, China. Nordic Journal of Botany 37(7): njb.02116. https://doi.org/10.1111/njb.02116

Yuan S, Zhang DX, Hao G (2018) *Primula chimingiana* sp. nov.(Primulaceae) from Sichuan, China. Nordic Journal of Botany 36(1–2): njb–01390. https://doi.org/10.1111/njb.01390